that we are familiar with in the arid regions of the United States also occur in south Africa. The climate of the coast of Cape Colony is warm, moist, and equable; that of the midland is colder and drier in winter and hotter in summer; the mountain climate is drier still and more bracing, but with extremes of heat by day and cold by night. In the eastern portion of south Africa hot winds are occasionally experienced during the summer; they come from the northwest and blow as if from a furnace; fortunately, they are not of long duration. Like the hot winds of Kansas and Nebraska, these are undoubtedly descending and warmed by compression, like the föhn of Switzerland and the sirocco of the Sahara.

The climate and agriculture of south Africa go hand in hand, for the soil is intrinsically very fertile, and wonderful results have been attained at the Irene estate near Pretoria. (See Letters from South Africa. Macmillan & Co., New York.) The Editor can add his own testimony as to the wonderful vineyards near Cape Town and along the coast districts, where the average production per vine or per acre is greater than in California.

The 22 double-page maps and the index make the Union-Castle Atlas a most acceptable addition to our library of works on climatology and geography. They will also be most useful to the students of the history of south Africa.

THE TEMPERATURE OF THE UPPER AIR AS OBSERVED ON MOUNTAINS AND WITH KITE METEOROGRAPHS.

The Report for 1902 of the British Association for the Advancement of Science, contains a short note on atmospheric temperatures and currents observed by means of kites in January and August, 1902, on the west coast of Scotland at Crinan, about 25 miles south by west of Oban and 70 miles southwest of the summit of Ben Nevis. Only £175 (875 dollars) were available for the purchase of the steam winding engine and other apparatus. The steam winder or reel was so adjusted as to run rapidly when the tension on the steel kite wire slackened, but slow up or stop or even reverse when the tension increased above a certain limit of safety. The author of the report and secretary of the committee, Mr. W. H. Dines, preferred various English devices to the American system of kites and apparatus. He says:

> In addition to the well known Richard instruments which have been ordered, it seemed desirable to obtain if possible, something cheaper, since the risk of losing the instrument is not small. I am experimenting with a cheaper form. I also hope to obtain correct determinations of the maximum height and the temperature at that height in the following manner. If a glass tube of uniform bore, sealed at the top, but with the other end under water or quicksilver, were sent up with a kite, it would, assuming constant temperature, give the maximum height, for the air in the tube, under the decreased pressure, would expand and bubble out, and on the descent, water would rise in the tube, and the height of the water or quicksilver would give the minimum pressure, and hence the maximum height. This is assuming constant temperature. But if an exactly similar tube were also used containing saturated vapor of alcohol, two equations would be obtained, from which the two unknown quantities, temperature and height, can be determined. I hope to perfect this method, since there are many occasions on which a kite and a couple of glass tubes might be risked when one would hesitate to send up instruments costing £20.
>
> The apparatus above described is now in use every day when the wind is suitable, but there seem to be very many days during the summer when a sufficiently strong wind does not occur. A velocity of about 15 miles per hour is necessary, or force 4 on the Beaufort scale; but the upper limit at which the kites will fly has not yet been determined.

The experiments detailed in this quotation seem at first sight to be in the wrong direction. The Marvin kites have often broken loose and been recovered. Sometimes the kite is slightly damaged, but the meteorograph never. We believe that there is no cause for anxiety as to the loss or injury of the expensive recording apparatus. The substitution of any arrangement for "recording minimum pressures and corresponding temperatures" means the loss of any reliable determination of the vertical gradients of temperature and their changes with altitude which are precisely the data that are needed in studying the problems that occur in modern meteorology. Mr. Dines states that the location of the kite station at Crinan was chosen because it seemed likely to give information as to the vertical temperature gradient over the great oceans, since the prevailing westerly winds must make observations at Crinan equivalent as a rule to those over the open sea. [Crinan seems to be surrounded by land and not by open sea.] It was also thought that some light would be thrown on the question as to how far the temperatures taken on a mountain summit (Ben Nevis) differ from those of the free air at the same level in the surrounding districts. Up to August 20, 68 flights had been obtained, and during these the lower winds were distributed as follows:

Land winds from NNW., N., E., SSE	15
Ocean winds from NW., W., S., SE	52
Blanks	1
Total	68

The heights attained seem to be rather lower than those reached in America with the same length of line paid out, but the wind velocities must be measured before we can compute the relative efficiency of the kites. We quote some of Mr. Dines's figures as a guide to those who wish an estimate as to the length of line needed in order to attain any desired altitude:

Vertical altitude, feet.	Length of line, feet.
6,400	10,300
6,000	10,300
4,760	10,600
5,500	10,200
7,250	12,000
8,950	17,300
8,550	16,000
8,370	13,500
6,900	12,000
7,175	13,000
7,425	18,000
11,450	21,350

The committee indorse Mr. Rotch's idea as to the importance of using a small steam vessel as a base station so as to be independent of feeble winds and calms.

In addition to the above report, Mr. Dines has given the discussion of his results in the Quarterly Journal of the Royal Meteorological Society. He has also published a general statement in Nature for June 18, 1903, p. 154, from which we quote the following:

> The evidence obtained from last summer's work is not sufficient to be conclusive, but so far as it goes it tends to show that as a depression approaches the decrease of temperature with elevation becomes less than it was before. This was the case with every depression that passed while the experiments were in progress, and it leads to the conclusion that the upper air in the neighborhood of a cyclone is relatively warm and that the cyclones are convectional effects.
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> A further result of the observations shows that the temperature of Ben Nevis was in every instance below that of the free air at the same level some 60 miles to the southwest, often from 5° to 8° F. below. That the two air temperatures should have agreed was hardly expected, but the difference was very marked, and it is desirable that the experiments should be repeated in the same locality to confirm the result. The fact, however, that the summit of the mountain is so often wrapped in clouds when the sky is clear elsewhere, tends to show that the summit must be unduly cold, and it seems likely that the effect is produced by the adiabatic cooling of the air as it is forced up the mountain slope. In fact, the cloud level on all the mountains and hills in the neighborhood was always much below the point at which the kites entered the clouds. It is also known from the differences in the barometer on Ben Nevis and the values computed from the Fort William readings that the temperature of the intermediate layers of the air is not truly represented by the mean derived from the summit and sea-level temperatures.[1]

[1] This is a general rule for all high and low stations, as was shown by R. Rühlmann in 1870 and by C. A. Schott about the same date. It has been confirmed by many studies since that time.—*C. A.*